An Advanced Platform for Space Solar Power

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An innovative baseline applying existing technologies in new ways.

Purpose

- **A baseline modularized platform concept focusing on ease of assembly, reliability, security, and maintenance issues**
- **A baseline that may be used for a cost comparison with more exotic concepts**

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- The baseline concept is a conventional looking geosynchronous, earth oriented spacecraft, with the transmitter always facing the earth and the solar panels rotating about the spacecraft north-south axis
- A functionally modularized spacecraft, all the modules are manufactured and tested on the ground and only attached together in orbit.
- An integrated high voltage bus and spacecraft structure for reduced weight and cost.
- A highly reliable distributed platform that will remain fully functional with any major failure.
- A secure Power Station that is impervious to both itinerant and targeted interference
- Already flight proven ISS type roll rings to carry the high voltage bus current across the rotary interfaces to the transmitter.

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Transmitter Modules

An important platform reliability trade off in determining the optimum transmitter antenna size has been identified

- **Since each transmitter module is thermally independent and limited in its thermal radiation area, as the overall antenna size is made smaller the module operating temperature increases. This shortens the module lifetime.**
- **What then is the optimum antenna size for the minimum number of initial and *replacement* modules? And the minimum cost?**
- **A methodology to answer these questions is being developed.**

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High Voltage Bus Issues

- There is an important trade off between the mass of the high voltage bus and the mass of the solar panels.
- As the aluminum conductor cross section is reduced, the voltage drop increases, and more solar cells are required for the same power input to the transmitter. What are the optimum proportions of the two for minimum cost?
- What is the maximum operating temperature for the aluminum? What happens when it gets too hot?
- What is the best high voltage bus size and shape to minimize the temperature? Cylinders? Flat Plates? etc.?
- How do you attach two lengths of conductors with an acceptably low resistance?

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Beam Phasing Reliability and Security

- **Beam phasing control of the transmitter array using GPS-like position and attitude sensing**
- **Encryption of high-power signal from ground to ensure secure, jam-proof control.**
- **Millimeter accuracy derived from the differential signals received from the ground and space based GPS-like transmitters.**

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BEAM CONTROL